Editorial

ECONOMY, AESTHETICS AND DURABILITY

In 1965, I made my first presentation at the four regional meetings of the AASHTO Subcommittee on Bridges and Structures (there were four regional meetings in those days) on the subject of “The Cost of the Medway Bridge if Built in the U.S.” The talk was based on applying intentionally inflated U.S. prices to the published quantities for the cast-in-place balanced cantilever Medway Bridge which had been recently completed in England.

Even with inflated U.S. prices, it appeared (to me) that the Medway Bridge with a main span of about 550 ft. would have been economically competitive in the U.S. As might have been expected, the suggestion that cast-in-place balanced cantilever concrete construction for long spans would be economical in the U.S. in 1965 was greeted with widespread skepticism. About six years later, the segmental concrete proposal for the Pine Valley Creek Bridge in California was selected on the basis of competitive bids.

An interesting current commentary on cost and aesthetics of precast balanced cantilever construction is provided in the newsletter by Frederick Gottemoeller (reprinted with permission of ASPIRE) concerning the Seattle Sound Transit Central Link.

Another perspective on both aesthetics and economy of segmental construction is provided by the enclosed brochure on the winning entries in the 2007 ASBI Bridge Award of Excellence Competition. The unit costs of $65.00 per sq. ft. for the Lee Roy Selmon Crosstown Expressway Expansion, and $120.00 per sq. ft. for the Susquehanna River Bridge are particularly noteworthy. Over the years, segmental concrete bridges have been selected for hundreds of awards, including four of the five Presidential Awards for Bridges by the National Endowment for the Arts.

The third edition of the ASBI “Survey of the Durability of Concrete Segmental Bridges” prepared by Brett Pielstick of Eisman and Russo, Inc. based on 2006 National Bridge Inventory data, is now being processed for publication, and will be distributed with the next edition of the newsletter. This survey again shows that concrete segmental bridges are performing well with time.

While the debate concerning bridge economy, aesthetics, and durability may continue for many years into the future, I am very comfortable viewing these issues from the segmental concrete perspective.
**2007 Convention**

Program and registration information for the November 4 – 7 Convention at the Orleans Hotel and Casino in Las Vegas was distributed in May, and is posted on the ASBI website www.asbi-assoc.org. As of the end of August, hotel reservations were more than 130 percent of our room block, which is unprecedented for our conventions. If you are planning to attend the convention and have not yet obtained a reservation at the Orleans Hotel and Casino, please do so as soon as possible. It appears that it may be necessary to obtain overflow space at another hotel for late registrations.

The 2007 Convention features an outstanding technical program as well as a Tuesday afternoon site visit to the Hoover Dam Bypass Bridge now under construction about 1,500 ft. downstream from Hoover Dam. A 1,060 ft. span concrete segmental arch is the featured element of the new bypass, which will cross the canyon almost 900 ft. above the Valley floor. Construction of the arch has been delayed by failure of the original highline in 70mph winds in 2006. However, the tour will provide an opportunity to view construction of what will be one of the most dramatic bridges in the U.S.

**Reservations**

Direct Reservations Phone Number: 1-800-675-3267 (identify you are with ASBI)
Monday – Friday: 7am – 11pm (Pacific Time),
Saturday and Sunday: 9am – 5pm (Pacific Time).

**Internet**

https://reservations.synxis.com/LBE/ rez.aspx?Hotel=11302&Chain=5325,
ASBI Internet Group Code 3487097.

**2007 ASBI Bridge Awards of Excellence**

A brochure is enclosed with the newsletter describing the judging and winning entries in the 2007 ASBI Bridge Award of Excellence Competition. As Chair of the ASBI Bridge Awards Committee Hala Elgaaly (Fig. 1) has now hosted three Bridge Award of Excellence Competitions, and we are grateful for her continued help with this program. Our thanks as well to the Jury of the 2007 competition:

- **George Christian**, New York State Department of Transportation
- **David Hohmann**, Texas Department of Transportation
- **Raymond McCabe**, ASBI President, HNTB Corporation
- **Benjamin Tang**, FHWA Office of Bridge Technology

**2007 – 2008 Grouting Certification Training**

There were 78 registrants (including 21 from 7 State DOTs) and 11 faculty at the 2007 Grouting Training held April 16-17 at the U. of Texas at Austin Conference Center. Over the past 7 years, 1050 engineers and construction personnel have participated in the grouting training. **Dywidag Systems International** provided the grouting equipment and personnel for the training and **BASF Building Systems** provided the prepackaged grout. **Andrea Schokker**,
assisted by graduate students Edwin Salcedo and Brian Swartz conducted the grouting demonstrations. The 2008 grouting training will be held April 14-15 at the U. of Texas at Austin Conference Center (see 2008 program and registration information enclosed with the newsletter).

Seattle Segmental Design and Construction Seminar
A seminar co-sponsored by ASBI and the FHWA Office of Bridge Technology, “Design and Construction of Segmental and Cable-Supported Bridges” was held in Seattle May 14-15. Attendance was 90, including 27 Transportation Agency personnel. A tour of the Seattle Sound Transit Central Link was arranged by PCL Civil Constructors, Inc. following the seminar (see enclosed brochure on Seattle Sound Transit Central Link).

ASBI Seminar for the 2007 IBC Conference
ASBI arranged a well-attended 4 hour seminar on June 5 for the 2007 IBC Conference on “Construction Practices for Concrete Segmental Bridges” in Pittsburg, Pa. The seminar program and speakers were as follows:

- Overview of Segmental Construction
  Myint Lwin, FHWA Office of Bridge Technology

- Construction of Precast Segmental Span-by-Span Bridges
  William J. Rohleder, Jr., FIGG

- Construction of Precast Balanced Cantilever Bridges
  David Jeakle, URS Corporation

- Construction of Cast-in-Place Balanced Cantilever Bridges
  John Crigler, VSL

- Production of Precast Segments with an Overview of Equipment for Handling, Transporting, and Erecting Precast Segmental Bridges
  Elie Homsi, Flatiron Constructors, Inc.

NCHRP Project 12-80, FY2008 LRFD Minimum Flexural Reinforcement Requirements
The first meeting of the Project Panel for NCHRP Project 12-80 was held August 9-10 at the NCHRP Office in Washington, D.C. The project panel will meet again on November 16 in Washington, D.C. to select the successful proposal to conduct this $200,000.00 research project, which will have an 18 month contract period. It is anticipated that the work may begin during the first quarter of 2008. The following background information concerning this project is included in the NCHRP Request for Proposal:

“The AASHTO LRFD Specifications prescribe minimum reinforcement in flexural concrete members to safeguard against brittle failure following flexural cracking. There are indications that the current provisions for minimum reinforcement, which are based on a factored cracking moment, an over strength limit, and a recently increased modulus of rupture of the concrete, may cause designers to use excessive amounts of flexural reinforcement, unnecessarily increasing the cost of the structure. There is no commentary on the applicability of the provisions to recent advances including but not limited to materials, continuous cellular cross-sections, unbonded tendons, or the Strength II load combination. Furthermore, there is concern that the current method may not produce consistent reliability.”

“Provisions for the design of minimum reinforcement must be established that are suitable for all structure and reinforcement types covered by the specifications. These provisions need to achieve an appropriate and consistent reliability. Commentary must accompany these provisions to explain their application and inherent assumptions.”
Seattle Sound Transit Central Link

The Seattle Sound Transit Central Link includes 4.2 miles of elevated guide-way constructed in restricted right-of-way, and subject to substantial seismic design requirements. A brochure on this project prepared by International Bridge Technologies, Inc. is enclosed with the newsletter.

The Fall 2007 issue of ASPIRE™ – The Concrete Bridge Magazine includes an article on the Seattle Sound Transit Central Link as well as the following AESTHETICS COMMENTARY by Frederick Gottemoeller (reprinted by permission of ASPIRE™):

This issue of ASPIRE™ brings an embarrassment of riches to someone who likes to see improved appearance in bridges—they are all noteworthy. Spokane’s Monroe Street Bridge is a particularly fine example of the sensitive reconstruction of an existing historic bridge. However, I decided to focus on the Seattle Sound Transit Light Rail Link because it helps answer a question that I am often asked: what is the increased cost of considering aesthetics?

The preliminary design for the Rail Link was quite a different structure. Based on the region’s experience in the construction of highway bridges, it had been assumed that precast concrete U-shaped girders would offer the most economical solution. After all, it is a long viaduct with many similar spans. However, that led to a design that required hammerhead pier caps at each pier and one girder for each rail track. The weight of the precast girders created construction difficulties, as did the many curves that had to be accommodated. With all of that in mind, the designer asked for and received permission to test that original assumption.

The result is the design now under construction. It turned out to be 15% less expensive than the preliminary design. It is also a much more attractive design. With a single segmental box section and without the miles of hammerheads, it is much sleeker, less massive, and more transparent. The designers did an excellent job of marrying the piers and the girders in an attractive and structurally honest way. Finally, the piers have vertical insets that create shadow lines that minimize their apparent width. At piers near stations mirrored tiles are set in these insets to create a flash of color for users approaching the structure, something that will surely be appreciated during Seattle’s rainy weather.

So now, when I am asked the question about the added cost of considering aesthetics I say, based on the Seattle Sound Transit Light Rail Link, the added cost is minus 15 percent! Of course, the real answer is, it depends. If you start with a standard structure and just add decoration to it, you automatically also add cost. But if you look at the problem from the ground up, considering all of the options and trying to improve the structure’s efficiency, economy, and elegance all at the same time, you will certainly come up with a better-looking structure. You might even save money while you’re at it.
Figure 4 -

The patriotic pylon light show will be used on Memorial Day, Fourth of July and Veterans Day.

Figure 5 -

Fireworks during the “Some Enlightened Evening” event light the Toledo sky, along with the debut of the night time pylon lighting, which is provided by 384 LED fixtures (Figs. 4 and 5).

Owner: Ohio Department of Transportation

Designer: FIGG

Contractor: Bilfinger Berger Civil, Inc.

Construction Engineer: International Bridge Technologies, Inc.

Construction Engineering Inspection: FIGG

Formwork for Precast Segments: EFCO

Erection Equipment: Strukturas, Paolo di Nicola, Underslung: Design by Somerset, Fabricated by Trinity Industries, Dallas, TX


Bearings and Expansion Joints: D.S. Brown

Epoxy Supplier and Prepackaged Grout: Grout – BASF Building Systems, DSI Epoxy – Sika

I-280 Veterans’ Glass City Skyway Dedicated and Open to Traffic

The Ohio Department of Transportation dedicated the new Veterans’ Glass City Skyway on June 23, 2007 in Toledo and it opened to traffic the following day, bringing to a conclusion the largest bridge project undertaken by the Department.

Designed by FIGG and constructed by Bilfinger Berger Civil, Inc., the precast concrete segmental bridge utilizes the largest number of strands in a cable stay bridge in the world, 156. It is also the first use of stainless steel as the sheathing material for the cable stays. It is one of the first two bridges to utilize a new cradle system for cable stay bridges, providing many benefits to the owner, included ease of maintenance and inspection.

The dedication and opening followed a May 24, 2007 “Some Enlightened Evening” event during which fireworks lit the sky, along with the debut of the night time pylon lighting, which is provided by 384 LED fixtures (Figs. 4 and 5).

The Ohio Department of Transportation

Designer: FIGG

Contractor: Bilfinger Berger Civil, Inc.

Construction Engineer: International Bridge Technologies, Inc.

Construction Engineering Inspection: FIGG

Formwork for Precast Segments: EFCO

Erection Equipment: Strukturas, Paolo di Nicola, Underslung: Design by Somerset, Fabricated by Trinity Industries, Dallas, TX


Bearings and Expansion Joints: D.S. Brown

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Epoxy – Sika

Figure 4 -
The patriotic pylon light show will be used on Memorial Day, Fourth of July and Veterans Day.

Figure 5 -
Fireworks during the “Some Enlightened Evening” event light the Toledo sky, along with the bridge pylon.
Penobscot Narrows Bridge & Observatory, Maine

Maine’s first cable stayed bridge received the 2007 International Bridge Conference George S. Richardson medal on June 4, 2007 and it was accepted by Maine Department of Transportation Chief Engineer John Dority, P.E. The new bridge (Fig. 6) opened to traffic on December 30, 2006, just 42 months after the emergency replacement need was identified. The 1,161’ cable stayed main span was cast-in-place with form travelers. The bridge utilizes a cradle system to carry the stays through the pylon and each stay includes two reference strands that may be removed and inspected at any time to analyze long term maintenance of the bridge.

On May 19, 2007, the three story glass observatory that is located at the top of the southern pylon (420’ above the Penobscot River) opened to the public. It is the world’s tallest public bridge observatory and has already drawn many visitors from around the world.

The bridge was celebrated on June 23 with a community organized BridgeFest that included parades across the bridge, a flyover, boat parade on the river, musicians and the debut of the bridge aesthetic lights, along with fireworks. In the week following BridgeFest, the two reference strands were removed in three stays (short, medium and long) and replaced with the first installation in the United States of carbon fiber strands. All of the stays in the bridge are being monitored with a variety of equipment to gather data on both traditional steel and the carbon fiber strands. The carbon fiber will be evaluated for use on future cable stay bridges.

The bridge was designed by FIGG and constructed by a joint venture of Cianbro/Reed + Reed in an owner facilitated design/build arrangement. FIGG also provided construction engineering and on site support throughout construction.

Owner: Maine Department of Transportation
Designer: FIGG
Contractor: Cianbro/Reed + Reed JV
Construction Engineer: FIGG
Construction Engineering Inspection: FIGG
Form Travelers for Cast-in-Place Segments: Strukturas
Post-Tensioning Materials/Stay Cables: DSI
Prepackaged Grout: Five Star Products, Inc.

Confusion Hill Bridges (a.k.a. South Fork Eel River Bridges), California

Work is progressing on the substructure of the 3-span cast-in-place segmental South Bridge (span lengths: 347.8’–570.9’–436.4’) (Figs. 7 and 8). Pier 2 is progressing rapidly upward and is within 20 feet of topping out at its 200 ft rise from top of footing to top of deck. The contractor expects to have the pier completed along with the pier table in approximately 8 weeks. The pier consists of a hollow rectangular shape with heavily confined corner elements consisting of welded hoops for good ductility performance. The piers also have deep architectural fluting.

The Contractor plans to complete the Pier 2 cantilever prior to Pier 3 and use the same travelers on each cantilever. The cantilevers consist of 17
segments on each side of the pier. Of the 17 segments, four of the segments are 13.1 feet long and the remaining are 15.4 feet long. The maximum segment weight is 200 tons. All of the 5 ft diameter CIDH piles (total 11 each) have been placed for the Pier 3 footing.

The slant leg North Bridge that will be cast-on-falsework is progressing ahead of the South Bridge (Figs. 9 and 10). Pier 3 has been completed and the 17.5 ft x 6.9 ft x 80 ft deep mined shaft has been completed for Pier 2. Concrete has been placed in the shaft to the cut-off point and reinforcement is currently being placed for Pier 2. Falsework is currently being constructed for the superstructure.

Additional project information and photos can be seen at: http://www.dot.ca.gov/dist1/d1projects/confusionhill/

Owner: California Department of Transportation (Caltrans)
Designer: California Department of Transportation (Caltrans)
Contractor: MCM Construction Inc.
Contractor’s Segmental Construction Engineer: Finley Engineering Group, Inc.
Construction Management & Engineering Inspection: California Department of Transportation (Caltrans)
Form Travelers for Cast-in-Place Segments: AVAR
Post-Tensioning Materials/Stay Cables: Schwager Davis, Inc.
Bearings and Expansion Joints: D.S. Brown
Some of the unique architectural features of the Devil’s Slide bridges (Fig. 11) are starting to be revealed as the Contractor has completed the first 149-foot long Pier Table of the southbound bridge (Pier Table 2L, Figs. 12 and 13). The curved exterior girders can be seen as well as the vertically bifurcated elements of the superstructure that give the bridge a graceful shallow arch look. The contractor is very close at completing the second and final pier table of the southbound bridge (Pier Table 3L, Fig. 14).

Segmental work will start very soon on the southbound bridge (left bridge). The form traveler has already been assembled on the main span side of the pier 2L table and the second traveler will be erected soon on the pier 3L table.

Piers have already been constructed for the northbound bridge (right bridge) and the first stage of the intricate pier table falsework erection has begun (at Pier Tables 2R & 3R). The contractor’s construction method will only use form travelers for the main span segments over the environmentally sensitive area of the valley. The back span segments will be constructed on falsework. Each cantilever will consist of three – 49.2 feet long segments cast-on-falsework in the back spans and nine 16.4 feet long segments in the main spans. Hold-downs will be used on the back span...
segments to keep the segments down on the falsework as three main span segments are progressively cast after each back span segment.

**Kiewit Pacific** has begun work on the tunnel portion of this project. Tunnel excavation for the twin 4000 foot long bores will progress from the south portals to the north portals where the bridges are located. The bridge contract is scheduled to be completed in 2008 prior to day lighting of the tunnels at the north portals.

Project information and progress photo’s can be seen at: http://www.dot.ca.gov/dist4/dslide/

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**Susquehanna River Bridge Opens to Traffic, Pennsylvania**

Construction is complete on the first concrete segmental bridge on the nation’s first superhighway, the Pennsylvania Turnpike. Westbound traffic began using the new Susquehanna River Bridge, near Harrisburg, on May 17, 2007 following a community fund raising event that saw more than 2,000 runners complete a race that included “once and done” on the new structures. Eastbound traffic began using the new structure one month later. The bridge was designed by **FIGG** for the Pennsylvania Turnpike Commission.

The bridge design features twin structures, each 5,910’ in length and 57’ wide to accommodate three lanes of traffic in each direction with wide shoulders (Fig. 15). Typical spans are 150’ and were erected span-by-span on cast-in-place piers founded on drilled shafts. The twin bridges cross the shallow, non-navigable Susquehanna River, in addition to rail lines, a state roadway on the river bank and Culver Island, in the middle of the river.

The Susquehanna River Bridge is the longest bridge on the
Pennsylvania Turnpike system and in close proximity to the Turnpike’s headquarters. During the design phase of the project, an owner’s charette was held with participants from the Commission who reviewed options for the pier shape and aesthetic treatment, the superstructure box shape and aesthetic lighting of the bridge. Turnpike Commission staff members regularly refer to the bridge as their first signature bridge and take great pride in creating a unique look for the bridge. The piers feature a stone patterned inlay (Fig. 16) that reflects the quarried limestone facade of the Headquarters building. The form liner created a ribbon of texture vertically up the center of the pier, visually adding to the pier slenderness. At the top of the pier, the limestone texture splays across the pier cap in the shape of a keystone, honoring Pennsylvania, the Keystone State.

Accent lighting is located under a lip on the segment wing (Fig. 17). An open barrier rail provides those crossing the new bridge with clear views of the wide river valley.

The Turnpike Commission awarded construction of the project to the Joint Venture Team of Edward Kraemer and G.A. and G.F. Wagman on November 16, 2004 with the low bid of $82,423,426.
includes eight spans at a total length of 2,950 feet, with a 65.5-foot-wide deck accommodating four lanes of traffic and two shoulders on a single-cell box girder.

The new bridge will carry eastbound traffic on an improved curved alignment as part of the widening of I-64 in Kanawha County. Westbound traffic will remain on the existing steel plate girder bridge. The project is a major piece of a long-term project to alleviate congestion and improve accessibility on I-64 through West Virginia.

The project design includes the construction of seven piers - five on land and two on the edge of the river. In addition to the 760-foot main span over a navigational waterway, the bridge includes 460-foot and 540-foot side spans and five additional approach spans ranging from 144 feet to 295 feet.

The continuous girder has a varying depth of 16 to 38 feet at the main span and a constant 16-foot depth at the approaches. The structure is designed to be built by balanced cantilever using form travelers with 175 cast-in-place segments.

Finley Engineering Group, Inc. supplied support and construction engineering assistance to Brayman during the pre-bid phase of the project, and will provide full construction engineering services to the contractor for the construction of the bridge.

Construction Begins on Allegheny River Bridge

The Walsh Group offered the low bid of $189 million for construction of the cast-in-place segmental I-76 Pennsylvania Turnpike Commission bridge over the Allegheny River, near Oakmont, upriver from Pittsburgh, Pennsylvania (Fig. 19). The bid includes associated roadway, interchange reconstruction and
toll facilities. New 2,350-foot twin structures will be constructed over active rail lines that are located on both shores of the Allegheny River and over Freeport Road, all vital links in the valley’s surface transportation network. The new bridge will be adjacent and downriver of the existing bridge and will span the navigable waterway of the Allegheny River with a 532’ main span. Additionally, the bridge will span over the back channel used by recreational boaters and over Fourteen Mile Island, a part of the Allegheny Island State Park administered by the Pennsylvania Department of Conservation and Natural Resources. The project is scheduled for completion in 2010. The bridge will be constructed as a cast-in-place concrete box girder in the balanced cantilever method, allowing many construction activities to take place one hundred feet above the scenic Allegheny River and Fourteen Mile Island. The new bridge will accommodate six lanes of traffic, plus acceleration and deceleration lanes for the interchange and toll collection facility at the western end of the bridge. The project includes total reconstruction of the interchange, several retaining walls, Gulf Lab Road Bridge and Hulton Road Bridge over the Turnpike. FIGG is the Engineer of Record for the river bridge and prime consultant for the project and is providing Construction Engineering Inspection services with McTish, Kunkel & Associates.

Owner: Pennsylvania Turnpike Commission
Designer: FIGG
Contractor: Walsh Group
Construction Engineering Inspection: McTish/FIGG